

### REMARKS

Claims 1 - 38 are presently pending. In the above-identified Office Action, the Examiner objected to the Information Disclosure Statement, Drawings, Specification and Claims 17 and 38. In addition, Claim 1 - 7, 17, 35 - 36 and 38 were rejected under 35 U.S.C. § 102(e) as being anticipated by O'Meara ('213). Claims 1 - 8 were rejected under 35 U.S.C. § 103(a) as being unpatentable over O'Meara in view of Komine ('784). Claims 17, 23 - 25, 35 - 36 and 38 were rejected under 35 U.S.C. § 103(a) as being unpatentable over O'Meara *et al.* ('364). Claims 8 - 12, 18 - 21 and 37 were rejected under 35 U.S.C. § 103(a) as being unpatentable over O'Meara ('213) in view of Byren ('462). Claims 13 - 16 were rejected under 35 U.S.C. § 103(a) as being unpatentable over O'Meara ('213) in view of Shen ('653). Claims 26 - 32 were rejected under 35 U.S.C. § 103(a) as being unpatentable over O'Meara ('364) in view of Byren ('462). Additional references were cited as being pertinent to Applicants' disclosure.

By this Amendment, Applicants enclose an Information Disclosure Statement, propose minor changes to the Specification, cancel Claims 1 - 38 and submit new Claims 39 - 57 for consideration. Also, please accept the drawing changes submitted herewith, specifically, please replace Figs. 5 and 6 with enclosed Figs. 5 and 6. These figures conform to the Specification as filed. No new matter has been entered. For the reasons set forth more fully below, Applicants assert that the subject application properly defines an invention patentable over the prior art. Reconsideration, allowance and passage to issue are therefore respectfully requested.

The present invention addresses the need in the art for a fast, large-stroke, high spatial bandwidth or high order system or method for effecting wavefront correction of a high-power beam. In accordance with the invention, aberrations in a return beam are detected and used to predistort a reference beam for a power amplifier beamline with a complex conjugate of a correction signal. After the reference beam is applied to a phase

conjugate mirror via the beamline, the mirror inputs a wavefront to the beamline effective to cause the beamline to output a wavefront predistorted to correct for the aberrations detected in the return beam.

The invention is set forth in claims of varying scope of which Claim 39 is illustrative. Claim 39 recites:

39. A beam control system comprising:  
 first means for detecting aberration in a first beam of electromagnetic energy **without amplification thereof** and providing an error signal in response thereto;  
 second means responsive to said error signal for providing a conjugate correction signal;  
 third means responsive to said conjugate correction signal for providing a predistorted reference beam;  
 fourth means including an amplifier for amplifying said predistorted reference beam to provide an amplifier distorted reference beam; and  
 fifth means for conjugating said amplifier distorted reference beam to provide said correction signal to said amplifier whereby amplifier provides an output beam predistorted to correct for said aberration in said first beam. (Emphasis added.)

None of the references, taken alone or in combination, teach, disclose or suggest the invention as presently claimed. Specifically, none of the references teach, disclose or suggest a beam control system adapted to detect aberrations in a return beam, without prior amplification thereof, and use the aberrations detected to adjust the output of an amplifier as presently claimed.

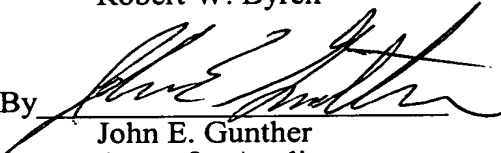
In the above-identified Office Action, the Examiner relied heavily on O'Meara ('213). However, it is clear that in accordance with the teachings of O'Meara, the return energy from the target must pass through the laser power amplifier 102 of Fig 6. This has four ramifications: (1) The aberration of the laser amplifier is added to the aberration of the atmosphere, making wavefront sensing more difficult. (2) The wavefront control (phase shifters in O'Meara) must also accommodate the more severe aberration, which may exceed the stroke and Zernike order capability of the adaptive wavefront control devices and processor. (3) The return beam is amplified in the laser power amplifier which is a noisy process, thereby degrading the performance of the wavefront sensor. And (4) the laser amplification is not linear (spatially and temporally) if it is designed for

good extraction efficiency due to saturation effects, and this affects the performance of the wavefront sensor, particularly where phase is inferred by amplitude modulation by a pinhole aperture as in O'Meara.

Moreover, the scheme shown in Figure 6 of the reference involves abrupt discontinuities in the spatial profile of the beam between the phase shifters, which may seriously degrade the brightness of the laser system due to diffraction at the discontinuities.

The shortcomings of O'Meara are not overcome by the teachings of other reference cited by the Examiner. Accordingly, reconsideration, allowance and passage to issue are respectfully requested.

Respectfully submitted,  
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